Notes on sub-bottom profilers, 6 July 2005

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Knudsen/Bathy Healy test, 7 August 2005 in shallow water

Knudsen, 3ms chirp, 50m range Plot (1710.png)
Knudsen, 3ms chirp, 100m range Plot (1730.png)
Knudsen, 6ms chirp, 100m range Plot (1910.png)
Knudsen, 12ms chirp, 100m range Plot (1950.png)
Knudsen, 24ms chirp, 100m range Plot (2010.png)
Knudsen, 24ms chirp, 100m range Plot (2010a.png)(with expanded horizontal scale).
Bathy2000, 25ms chirp Plot (0807-03.png)
Bathy2000, 5ms chirp Plot (0807-04.png)

Comments on Knudsen test results:
1) Increasing the display window range increases the number of samples in the SEG-Y trace. No other affect.
2) Increasing the pulse length decreases the ping rate and thus the horizontal scale.
3) Increasing the pulse length from 6 to 12 or to 24 also changed the sample interval and number of samples in the SEG-Y data. The time window remains constant. The ping rate also decreased resulting in lower spatial resolution.
4) The long pulses (12 and 24) are poor because of the shallow water depth and spatial aliasing caused by too low of a ping rate.
5) Healy's draft is 8.5m. Knudsen data are corrected to a datum of sea level. (Use the water bottom multiple).

Comments on the Bathy data:
1) We don't understand why the data look poor. We'd like to do more tests. Might have overdriven (too much power). Also need to figure out why there are small time shifts in the data - check if the deep water delay is a multiple of the sample interval.

Notes on Knudsen operational parameters:
Power: Controls the transmit (transducer output) power level. Changes the duty cycle of the switchmode transmitter output stage. High power produces the strongest echoes but produces more ringing and reverberations in shallow water. Using high gain and high power may saturate the reveiver.
Gain: Controls the analog receive gain. Use less in shallow, more in deep water.
AGC: Automatic Gain Control adjusts every amplitude on every ping so that the average amplitude within a sliding window are equal. AGC is done in the analog part of the system and affects the recorded data as well as the displayed data. See TVG. This AGC is rarely used even though the manual suggests using

it when the bottom tracking algorithm is having trouble.

TVG: Time Varying Gain. Set via the "sounder" pull down menu. Applies a linear gain function from the picked water bottom. Affects the display and KEB files only. SHOULD ALWAYS BE USED WITH THE LOW FREQUENCY CHIRP.

Pulse Type: The length of the output chirp signal. The longer the chirp, the more the power (thus penetration). A longer pulse is needed in deep water. The correlation process introduces edge effects, resulting in lower time resolution, which can be seen in lower amplitude (weaker) returns. The edge effects could not be seen in the 3ms or 6ms examples. The Pulse Type also controls the outgoing ping rate, affecting the spatial resolution.

Processing Gain: Controls the signal amplitude on the display and in the KEB files, but not the SEG-Y files. Each step is a factor of two (left shift of one bit). The Knudsen manual says "0 is best for most" cases.

Range: The size of the data window, both on the display and in the binary KEB and SEG-Y files. Data outside the data window are ignored. When using SEG-Y recording, a 500m range is recommended.

Phase: The depth of the center of the data window whose width is "range". When using SEG-Y recording the phase must be adjusted according to the slope of the water bottom.

Auto-Phase: The data window ("range" wide, centered at"phase") can be automatically changed depending on the depth automatically detected. Unfortunately, this mode creates many SEG-Y files and requires signficant operator intervention, so it never used when SEG-Y data are output.

Velocity: The velocity to convert the measured two-way travel-time to depth. The accuracy of the depth displayed is only as good as the velocity used to convert time to depth.

100m of sub-bottom penetration is not uncommon. If water bottom is in the middle of the data window, then the range of the data window must be at least 200m or data will be lost.

of the data window is